CLITRAVI

CENTRE DE LIAISON DES INDUSTRIES TRANSFORMATRICES DE VIANDES DE L'U.E.
LIAISON CENTRE FOR THE MEAT PROCESSING INDUSTRY IN THE E.U.

RED MEAT: DOES IT HAVE A ROLE IN CARDIOVASCULAR DISEASE, OBESITY OR TYPE 2 DIABETES?

COMMUNICATING THE EVIDENCE



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1. Background

Red meat has been eaten by humans for millennia – both in fresh and processed forms. In the past few centuries, there has been increased awareness of the role of diet in the development of cardiovascular disease (heart disease and stroke), obesity and type 2 diabetes. This has led to theories about which foods, ingredients and diets can help prevent, or cause, these conditions. Red and processed meats (RPM) are a group of foods which have often come under the spotlight.

2. Purpose of the toolkit

The purpose is to equip member companies with accurate information that can be used in country-specific communications – both proactive and reactive – about RPM and cardiovascular disease, obesity or type 2 diabetes.

The toolkit consists of:

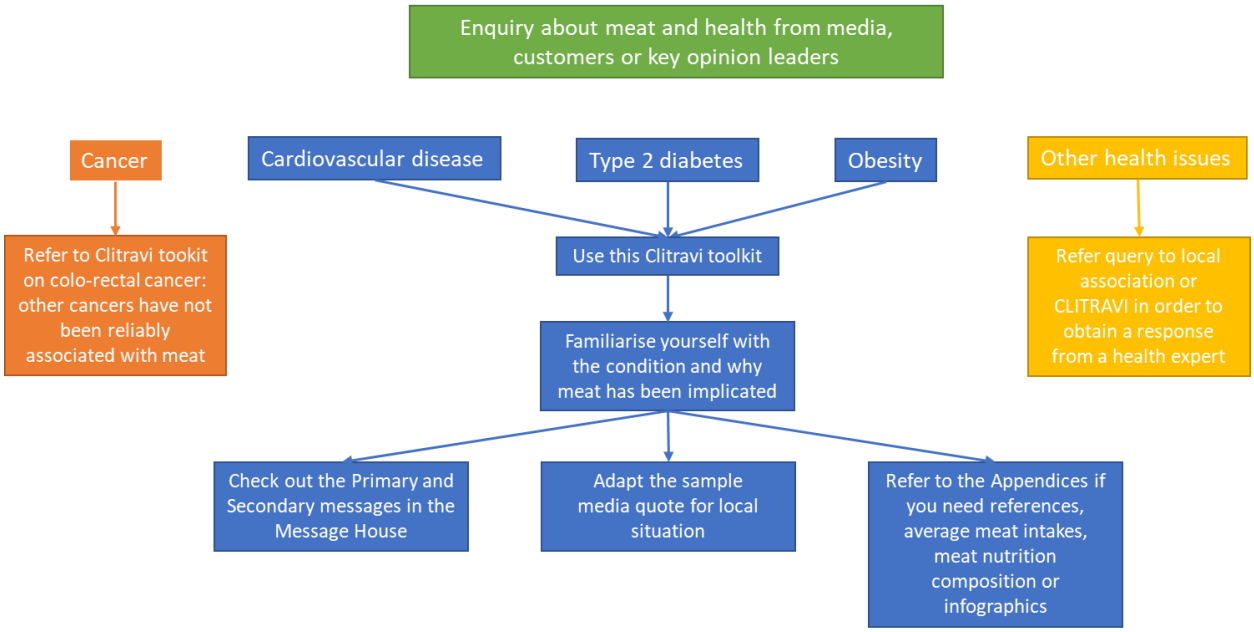
- A simple explanation of these health conditions;
- A message house which summarises the evidence for each condition;
- Sample media quotes;
- Tables summarising high quality evidence from randomised controlled trials;
- Facts and figures about the nutritional composition of red and processed meat;
- Examples of infographics.

<u>Red meat vs. processed meat</u>

WHO defines red meat as unprocessed mammalian muscle meat, i.e. beef, veal, pork, lamb, mutton, horse, and goat meat (fresh, minced or frozen).

Processed meat is defined as meat that has been *transformed* through salting, curing, fermentation, smoking, or other processes to enhance flavour or improve preservation.

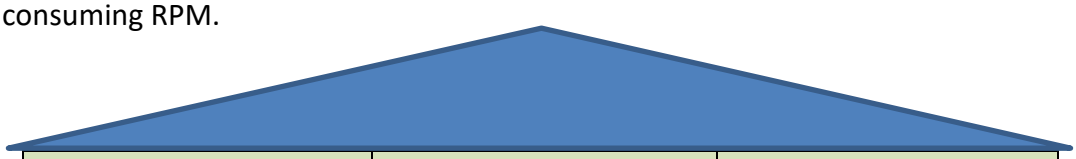
3. How to use the toolkit



4. Message summary

The overarching theme remains: '**moderate intakes of red and processed meat are consistent with good health when enjoyed as part of a healthy, balanced diet and lifestyle**'.

Primary messages are **reactive** while secondary messages are **proactive** and add the positive benefits of consuming RPM.



	CARDIOVASCULAR	*OBESITY*	*TYPE 2 DIABETES*
Primary message	RPM is not a cause of cardiovascular disease according to high quality research studies.	High daily calories and lack of exercise increase the risk of obesity, not individual foods.	RPM has no impact on blood glucose levels. There is no evidence that it causes diabetes.
Secondary message	Clinical trials show that daily RPM consumption has neutral or positive effects on heart health markers.	RPM is high in protein which helps people feel fuller for longer. This is proven to support body weight management.	RPM can be part of a healthy diet as it is naturally low in carbs and the protein can help appetite control.

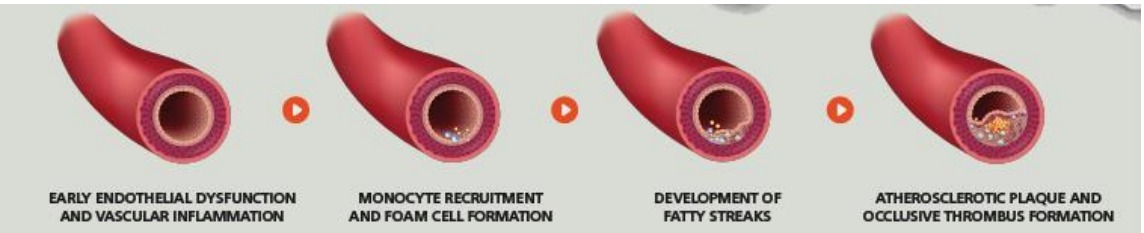
5. Glossary of terms

BMI	Body mass index (a way of assessing obesity)
CVD	Cardiovascular disease
HDL cholesterol	High density lipoprotein cholesterol – 'good' cholesterol
LDL cholesterol	Low density lipoprotein cholesterol – 'bad' cholesterol
RCT	Randomised controlled trials
RM	Red meat
RPM	Red and processed meat

6. Cardiovascular disease

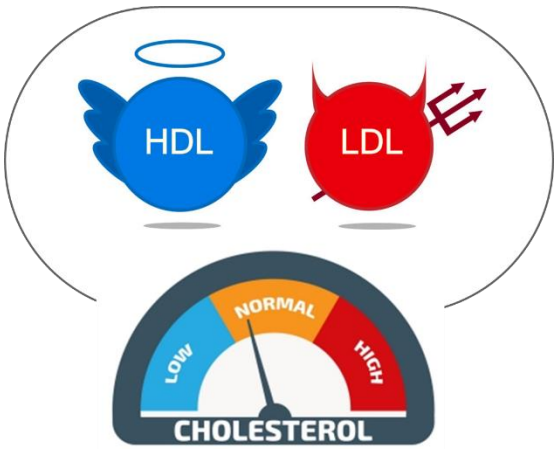
6.1. What is it?

Cardiovascular diseases (CVDs) are disorders of the heart and blood vessels and include coronary heart disease, cerebrovascular disease, rheumatic heart disease and other conditions[1]. These include coronary artery diseases, such as angina and myocardial infarction (commonly known as a heart attack). Other CVDs include stroke, heart failure, hypertensive heart disease, rheumatic heart disease, cardiomyopathy, heart arrhythmia, congenital heart disease, carditis, aortic aneurysms, peripheral artery disease, and venous thrombosis.



6.2. Why is RPM implicated?

Several decades ago, researchers discovered that blood cholesterol was linked with the probability of developing CVD. A type of cholesterol, called low-density lipoprotein cholesterol, or LDL-cholesterol was blamed.



Since saturated fats (fats typically found in foods of animal origin) can boost LDL cholesterol, researchers assumed that these types of foods should be avoided to protect heart health. This meant that people were often advised to eat less RPM, cheese, cream, butter, cakes, biscuits and desserts.

Fears were also raised about dietary sources of cholesterol, such as eggs and seafoods. We now know that these foods have a minimal impact on blood cholesterol.

Processed meats have also been linked with CVD because they contain salt. There is evidence that high salt intakes are linked with higher blood pressure which is a risk factor for CVD.

6.3. What does the evidence say?

The research on CVD has become very controversial in relation to saturated fat, but not salt.

Public bodies still agree that saturated fats, and even total amounts of fat in the diet, are a problem and should be minimised. This means that dietary guidelines continue to advocate low fat diets with minimal saturated fats plus high amounts of starchy carbohydrates.

[1] https://www.who.int/cardiovascular_diseases/en/

A recent report by the UK's Scientific Advisory Committee on Nutrition[2] determined that saturated fat reduction should remain a valid public health target. SACN recommended a maximum of 10% daily calories from saturated fat (around 20g per day which equates to 8 pats (5g) of butter or six sausages).

However, several large studies show that many people with high blood cholesterol levels don't develop CVD[3], while people with lower cholesterol levels are at risk[4]. This emphasises that saturated fat and cholesterol are not the main story in CVD development. So what is?

According to newer research, **central (visceral) obesity** is the underlying factor in the development of a host of conditions including CVD[5] and type 2 diabetes[6]. Visceral obesity is when large deposits of fat are laid down around the abdomen – often called an 'apple shape'.

- Saturated fat does not seem to be a reliable predictor of CVD
- Central obesity is thought to be more important
- Links between CVD and RPM are found in observational studies which have methodological problems
- In contrast, randomised controlled trials suggest that RPM has a neutral impact on CVD risk factors
- However, high salt intakes are still seen as an issue, although levels in processed meats have been reducing.

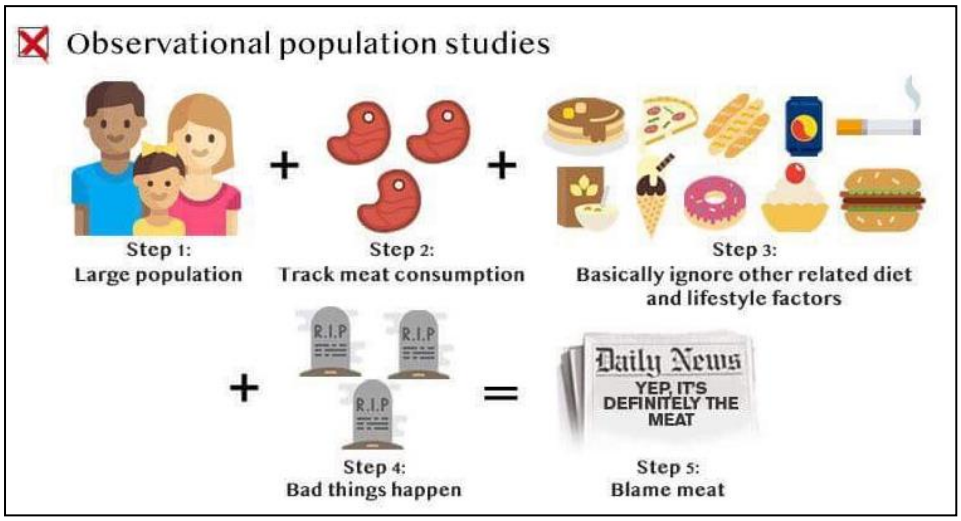
People with a lot of visceral fat are more likely to develop poor blood glucose control, high blood insulin levels, insulin resistance, high blood pressure, high blood lipids (fats) and inflammation. The strong link between CVD risk and visceral obesity, even in otherwise healthy individuals, implies that visceral obesity should be a key target of prevention rather than specific lipid measurements[7].

In terms of links between RPM and CVD, the evidence comes mostly from epidemiology (observational) studies which measure a multitude of factors in thousands of people and then trawl the data to look for statistical associations. As is the case with colo-rectal cancer (see the CLITRAVI toolkit on this), the studies looking at RPM and CVD have fundamental errors such as:

- Use of food frequency questionnaires which are inaccurate and prone to recall bias (where people find it difficult to remember accurately what they ate);
- Confounders – which are other factors related to CVD but which have not been measured or taken into account in the study;
- Imprecise and inconsistent definitions of RPM.

[2] https://www.gov.uk/government/consultations/saturated-fats-and-health-draft-sacn-report
[3] Ravnskov et al. (2018) https://www.ncbi.nlm.nih.gov/pubmed/30198808
[4] Castelli et al. (1996) https://www.ncbi.nlm.nih.gov/pubmed/8831910
[5] Britton et al. (2013) https://doi.org/10.1016/j.jacc.2013.06.027
[6] Papaetis et al. (2015) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4495144/
[7] De Larochellière E et al. (2014) https://www.ncbi.nlm.nih.gov/pubmed/24589564

The issues with observational studies can be summed up in the visual below:



Consumers with high RPM intakes tend to have other habits such as smoking, higher alcohol intake, low intakes of vegetables and wholegrains, higher waist circumference and body mass index, lower education and less physical activity[8,9]. All of these are risk factors for CVD, as well as cancer and type 2 diabetes. This is why it is easy to blame RPM in observational studies – although it is not accurate or justified.

6.4. Are there any benefits to RPM intake?

Yes, according to *randomised controlled trials* (RCT) which are the best available study design for human research[10].

Several RCT have been carried out which compare the impact of red meat (mostly lean cuts) versus other proteins, e.g. soya, fish or white meat. Daily intakes varied between 50 to 170g daily while a range of CVD markers were measured, such as blood pressure, cholesterol, triglycerides and body weight.

The majority of studies found a neutral impact, or a modest benefit, from consuming red meat in a balanced diet – this was even at intakes of 170g daily which is above some countries' recommendations. See **Table 1 in Appendix 1** for a summary of the findings and references.

In addition, a **meta-analysis** of 24 randomised controlled trials[11], reported that there were no significant differences in blood cholesterol (total, LDL or 'good' HDL cholesterol) when people ate less than half a portion of RPM daily (estimated to be 35g) compared with people who ate more than this amount daily.

[8] Fogelholm et al. (2015) https://www.ncbi.nlm.nih.gov/pubmed/25969395
[9] Grosso et al. (2017) https://www.ncbi.nlm.nih.gov/pubmed/28850610
[10] RCT sit near the top of the Evidence Pyramid just below systematic reviews of RCT https://www.cebm.net/2009/06/oxford-centre-evidence-based-medicine-levels-evidence-march-2009/
[11] O' Connor et al. (2017) https://academic.oup.com/ajcn/article/105/1/57/4633933

6.5. Message house

The key messages for RPM and CVD are suggested below:

Primary message	RPM is **not a cause of CVD** according to high quality studies which include randomised controlled trials and meta-analyses. Observational studies must be discounted because they cannot control for other lifestyle factors, such as low physical activity or low vegetable intakes which are often seen amongst the highest consumers of RPM.
Secondary messages	Clinical trials show that daily lean red meat within a healthy diet has a **similar effect** on markers of heart health, such as cholesterol and blood pressure, when compared with white meat or vegetable protein sources. There is an EU **authorised health claim**[12] that "Thiamine contributes to the normal function of the heart". Pork is rich in thiamine[13].

6.6. Sample media quote

It is recommended that you ask a local expert, such as a medic, academic, dietitian or nutritionist to be quoted in press releases or rebuttals.

Dr xxxx said: "Heart disease and stroke are not caused by one food, such as how much meat you eat, but are related to several key lifestyle factors such as smoking, excess body fat around your middle, lack of exercise and refined carbohydrates. No reputable, controlled studies have found any direct negative impact of red or processed meats on cardiovascular health. In fact, several clinical studies have reported that eating lean red meat in a balanced diet has a neutral or even positive effect on blood cholesterol and blood pressure. For those reasons, it is perfectly safe and beneficial to continue eating moderate amounts of red and processed meat".

If challenged on salt:

"Salt is added to preserve processed meats as has been the case for thousands of years. Salt in processed meats have been reduced as much as is practicable - it can't be taken out completely or this would affect food safety, taste and texture. Processors are doing their best, where possible, to reformulate products reducing salt. Always by taking into account that food safety comes first. Salt levels in processed meats are often lower than in meat-free options. For example, vegetarian 'sausages' contain 1.5g of salt per serving while regular meat-containing sausages contain 1.1g of salt per serving[14]. Ham contains 0.8g salt per 2 slices – the same as you find in 2 slices wholemeal bread or 30g of cheddar cheese".

[12] https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32012R0432&from=EN
[13] https://efsa.onlinelibrary.wiley.com/doi/pdf/10.2903/j.efsa.2009.1222
[14] Based on data from Tesco website for Linda McCartney vegetarian sausages versus Tesco Finest Pork sausages. Collated on 23rd January 2019. Use local data if available.

7. Obesity

7.1. What is it?

Obesity describes an excess of body fat[15]. Anyway many overweight and obese people can live healthy lives. However, it is well accepted that excess fat – particularly in the abdominal area – increases the risk of heart disease, stroke, type 2 diabetes, high blood pressure and cancer.



Obesity is assessed using a ratio of weight to height – called body mass index (BMI). An adult with a BMI over 25 is 'overweight' while an adult with a BMI over 30 is 'obese'. Children are assessed differently using height and weight percentile charts because they are still growing.

The root cause of obesity is poor energy balance. This is where people eat more calories than they burn in daily life and exercise. However, there are many lifestyle and social factors that influence our dietary choices by encouraging us to eat too much and move too little. This makes it very hard for large sections in the population to control their body weight[16].

Currently, a mass of studies concerning diet and overweight/obesity have been published. However, the role of diet in the aetiology of over-weight/obesity remains controversial. One reason for inconsistent findings may be the traditional single nutrient-based approach in nutritional epidemiology, commonly applied in most nutritional epidemiological researches. Therefore, a measurement of the overall dietary intake-dietary pattern has been recommended, which reflects the dietary intake complexity as an approach to investigate the links between diet and disease.

7.2. Why is RPM implicated?

Misuse of epidemiology is the issue once again. Most observational studies looking at red meat report associations with obesity, weight gain or body fat. Some do not. Remember that observational studies are not the right format for testing whether a single factor causes a particular condition. You need a randomised controlled trial for that.

[15] https://www.who.int/en/news-room/fact-sheets/detail/obesity-and-overweight
[16] Public Health England (2017) https://www.gov.uk/government/publications/health-matters-obesity-and-the-food-environment/health-matters-obesity-and-the-food-environment--2

Analyses which combine the results from observational studies – called meta-analyses – simply compound and exaggerate the problems with observational studies. We saw this in a 2014 meta-analysis[17] which concluded: "*The current analysis revealed that red and processed meat intake is directly associated with risk of obesity, and higher BMI and WC. These findings suggest a decrease in red and processed meat intake in the general population may have a favourable effect on obesity*".

Here is an example of this wrong thinking: there is good evidence that aspirin use is correlated with an increased risk of headaches. Therefore, you might suggest that aspirin is to blame for headaches and taking it off the market might have a beneficial effect. However, you would be wrong.

Another example could be the one of studies which showed that watching television was "significantly correlated" with obesity. Of course, there is no reason why watching TV would cause someone to gain weight, so we instinctively know that TV must be a marker for some other behaviour, e.g. sedentary lifestyle or overeating, which is driving the impact on obesity.

In the same way, red meat is blamed for obesity when it is simply part of a diet eaten by people who have other lifestyle issues, such as excess calories, unhealthy diets, low physical activity and increased alcohol intake. There is nothing particular in meat that would drive obesity if the other aspects of your lifestyle were healthy and balanced.



7.3. What does the evidence say?

Several observational studies[18] report that higher intakes of RPM are statistically associated with obesity, but these should be discounted because randomised controlled trials, which are better designed studies, give a different answer.

Table 2 in Appendix 1 provides a summary of randomised controlled trials where RPM has been compared with other foods. Apart from one study where RPM was switched for

[17] Rouhani et al. (2014) https://www.ncbi.nlm.nih.gov/pubmed/24815945
[18] Rouhani et al. (2014) https://www.ncbi.nlm.nih.gov/pubmed/24815945; Schlesinger S et al. (2019) https://www.ncbi.nlm.nih.gov/pubmed/30801613

mushrooms over a year, the other studies do not find any differences in body weight when people ate RPM or white meat or even plant proteins.

Interestingly, a new short-term study[19] compared appetite and energy (calorie) intakes after participants ate high protein, high fibre diets rich in animal protein (veal, pork, eggs) or legumes. No differences were found between the two types of diet suggesting that neither had the advantage for controlling appetite and daily calorie intakes. This goes against the belief that eating lots of meat makes you overeat and gain weight.[20]

7.4. Are there any benefits to RPM intake?

Meat is high in protein and there is good evidence that high protein foods and diets are more likely to support appetite regulation and weight control. A 2014 review[21] said: "*A protein intake of 0.8 g/kg/day is sufficient to sustain a negative energy balance in adults, irrespective of the protein source*".

This level of protein equates to 50g for a typical 70kg person; an amount found in 160-170g of lean beef or pork, 200g gammon, 335g of cooked soya mince, or 8 eggs. Clearly, for health reasons, 50g of protein per day should come from a variety of dietary sources.

Fibre is also important for appetite control so recipes promoted by the meat industry should stress a combination of meat, vegetables and wholegrains in order to be consistent with good dietary advice.

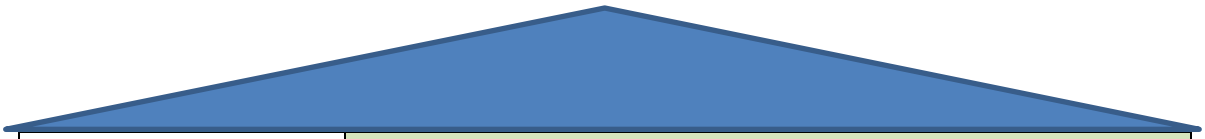
[19] Nielsen et al. (2018) https://www.ncbi.nlm.nih.gov/pubmed/29337861

[20] Many studies (EPICSpain Study, EPIC-PANACEA project, PREDIMED Study, ATTICA study, CYKIDS study children with a high KIDMED) suggest that promoting the Med-Diet pattern as a model of healthy eating may help to prevent weight gain and the development of overweight, obesity and central obesity.
Med-diet pattern is characterized by a high consumption of plant foods (fruits, vegetables, breads, other forms of cereals, legumes, nuts, and seeds), fresh fruit as the typical daily dessert, abundant use of olive oil as the major culinary fat, moderate consumption of dairy products (mainly cheese and yogurt), poultry, fresh fish, seafood, and eggs, low consumption of red and processed meat, and frequent but moderate intake of wine, usually with meals.
The Mediterranean Diet has always included the consumption of animal proteins. In fact, in the Mediterranean dietary model meat, fish, eggs and legumes are considered part of the group of foods that provides protein, in addition to the group related to milk and derivatives.
This model invites you to select a variety of protein-rich foods to improve the intake of valuable nutrients for your health. The suggestion is to adjust the consumption according to portions and frequencies that depend on age, sex and level of physical activity. In particular for meat, the basic suggestions are to prefer lean cuts and to season the preparations using exclusively extra virgin olive oil, limiting the sodium intake.

[21] Martens et al. (2014) https://www.ncbi.nlm.nih.gov/pubmed/24310056

7.5. Message house

The key messages for RPM and obesity are suggested below:



Primary messages	High daily calories and a lack of physical activity are the key factors which increase the risk of obesity, not individual foods such as RPM. There is nothing in RPM which would be expected to stimulate appetite or boost energy intake and obesity risk. No mechanisms have been agreed by scientists. Observational studies must be discounted because they fail to account for lifestyle factors in high meat eaters that relate independently to obesity risk, such as low physical activity.
Secondary messages	Clinical trials show that daily lean red meat within a healthy diet has a **similar effect** on body weight, body fat, energy intake and appetite when compared with white meat or vegetable protein sources. RPM is high in protein which helps people feel fuller for longer. This is proven to support body weight management.

7.6. Sample media quote

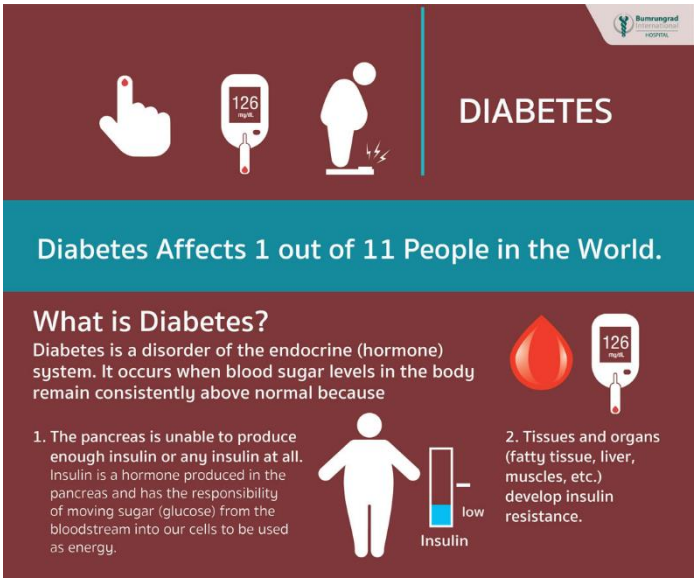
It is recommended that you ask a local expert, such as a medic, academic, dietitian or nutritionist to be quoted in press releases or rebuttals.

Dr xxxx said: “There is no convincing evidence from high quality studies that eating red and processed meat causes obesity or makes weight gain more likely. Indeed, controlled clinical trials show time and again that red meat has a similar effect on body weight, appetite and calorie intake when you compare it with white meat or plant proteins. This is even the case in calorie controlled diets for people trying to lose weight. Enjoying meat in a balanced diet could actually support body weight control because high protein foods help us to feel fuller for longer after eating”.

8. Type 2 diabetes

8.1. What is it?

Diabetes is when production of the hormone, insulin, is impaired resulting in poor control of blood glucose (sugar) levels. There are three types of diabetes[22]:



Type 1 is typically caused by an auto-immune reaction where the body's defence system attacks the cells that produce insulin. The reasons for this are not fully understood. People with type 1 diabetes produce little or no insulin and generally need insulin injections.

Type 2 is often called non-insulin dependent diabetes or adult-onset diabetes, and accounts for at least 90% of all cases of diabetes. It is characterised by insulin resistance and relative insulin deficiency. It is often, but not always, associated with overweight or obesity.

Gestational diabetes is a form of diabetes consisting of high blood glucose levels during pregnancy. It develops in one in 25 pregnancies worldwide and is often temporary.

There are about 60 million people with diabetes in the European Region, or about 10.3% of men and 9.6% of women aged 25 years and over[23].

8.2. Why is RPM implicated?

A review of observational studies[24] reported that higher RPM consumers were 32% more likely to develop type 2 diabetes compared with low meat consumers. A meta-analysis[25] found that type 2 diabetes relative risk (RR) was 20% higher (RR 1.20) when 100g of unprocessed meat was eaten daily, and 50% higher (RR 1.50) when 50g of processed meat was eaten daily.

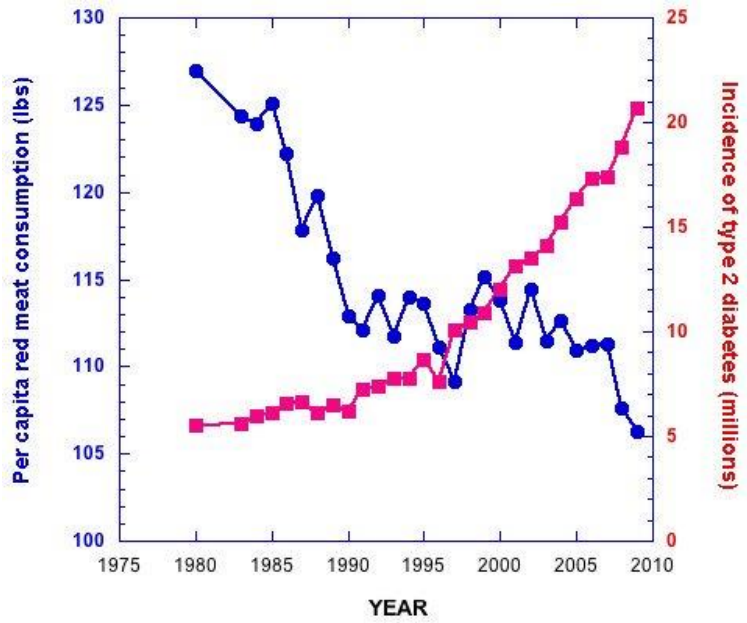
These are typical findings from observational studies, with the same limitations and reservations as have been explained for CVD and obesity. Remember that the figures relate to relative risk, not absolute risk, and are rather insignificant. To provide some context, an obese person has a 728% increased risk of developing type 2 diabetes (RR 7.28) than someone of normal weight[26].

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[22] International Diabetes Federation https://www.idf.org/aboutdiabetes/what-is-diabetes/types-of-diabetes.html
[23] http://www.euro.who.int/en/health-topics/noncommunicable-diseases/diabetes/data-and-statistics
[24] Wolk (2017) https://www.ncbi.nlm.nih.gov/pubmed/27597529
[25] Pan et al. (2011) https://www.ncbi.nlm.nih.gov/pubmed/21831992
[26] Abdullah et al. (2010) https://www.ncbi.nlm.nih.gov/pubmed/20493574

A 2015 review[27], funded by the UK's Meat Advisory Panel, said: "*The majority of studies conducted to date have been observational cohorts which cannot determine cause and effect. Most of these used food frequency questionnaires which are known to be subject to misclassification errors. Clearly, more randomised controlled trials are needed to establish whether red meat consumption impacts on markers of glucose control. Until then, conclusions can only be viewed as speculative*".

An interesting piece of data from the US is the association between meat intakes and risk of type 2 diabetes which suggest that, over time, Americans are eating less meat but are more likely to develop diabetes!



US data. Based on data provided by the USDA Livestock & Meat Domestic and the CDC/National Center for Health Statistics

A major limitation in the red meat-diabetes hypothesis is that there is no consensus on why red meat should boost diabetes risk. After all, it is almost lacking in carbohydrates and would not be expected to have a demonstrable impact on blood glucose levels or insulin secretion.

A proposed mechanism that is red meat stimulates inflammation but this has not been found in randomised controlled trials, such as one comparing a low fibre diet containing 150g RPM daily with a high fibre, meat-free diet[28]. Another theory is that red meat promotes damaging chemicals in the body, called advanced glycation end products (AGEs), which lead to inflammation. However, a study comparing high RPM intakes (200-300g daily) plus refined carbohydrates with a low meat, high dairy, wholegrain diet found no such effects on AGEs[29].

The lack of a convincing reason *why* RPM might impact on type 2 diabetes risk means that any associations from observational studies must be considered speculative and cannot be used to guide dietary policy.

[27] Ruxton & Derbyshire (2015) https://www.emeraldinsight.com/doi/abs/10.1108/NFS-12-2014-0103
[28] Karusheva (2018) https://www.ncbi.nlm.nih.gov/pubmed/30619502
[29] Kim et al. (2017) https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5409675/

8.3. What does the evidence say?

As for CVD and obesity, we get totally different results from randomised controlled trials. **Table 3 in Appendix 1** provide a summary of the evidence and show that whether we are comparing RPM with white meat, plant proteins or meat-free diets, there are no differences in the outcomes.

When included in a balanced diet, RPM is just as likely as these so-called healthier options to improve metabolic syndrome, insulin sensitivity or blood glucose levels. The only study reporting a detriment for RPM combined it with refined grains, which would be expected to have a high glycemic index and load – two factors that certainly would impact on blood glucose control.

So, at the end of the day, there is no evidence from these highly controlled studies that RPM causes diabetes or makes blood glucose control any worse. Indeed, one 4-week intervention study comparing red meat versus dairy found better insulin sensitivity on the high meat diet[30]. Another 8-week trial found that cutting meat out of the diet did not improve beta-cell function in the pancreas of patients with type 2 diabetes[31].

8.4. Are there any benefits to RPM intake?

The overall evidence from RCTs suggests a neutral impact on blood glucose control. However, it could be said that, like other protein-rich foods, RPM is useful for promoting satiety and appetite control and this could support weight management. Lowering body weight, especially central fat, is one of the best ways of reducing the risk of type 2 diabetes and metabolic syndrome (where several risk factors are combined).

Weight loss is also recommended for the majority of people with existing type 2 diabetes as this can improve long-term blood glucose control and reduce the risk of medical complications. Again, lean RPM can be included safely in this type of diet.

Chromium is a mineral that may help to support normal blood glucose levels. There is an authorised EU claim that: "*Chromium contributes to the maintenance of normal blood glucose levels*". In order to use this claim, foods need to contain at least 15% of the Nutrient Reference Value (40 micrograms) which is at least 6 micrograms per 100g or typical serving. There are few official data on the chromium content of foods, but pork appears to contain sufficient levels to leverage a claim[32]. If industry wishes to consider claims for chromium, a specific nutritional analysis is recommended.

[30] Turner (2015) https://www.ncbi.nlm.nih.gov/pubmed/25809854
[31] Nowotny (2015) https://www.ncbi.nlm.nih.gov/pubmed/25425219
[32] EUFIC https://www.eufic.org/en/food-today/article/chromium-in-the-diet

8.5. Message house

The key messages for RPM and type 2 diabetes are suggested below:

Primary messages	RPM is practically free of carbohydrate and has no impact on blood glucose levels. There is no agreed mechanism to explain why RPM causes diabetes. Therefore, observational studies which report links between RPM and diabetes must be discounted as they are likely to be random or spurious findings. Obesity, lack of physical activity, and diets high in refined carbohydrates are the main drivers of type 2 diabetes and should be the focus of health promotion.
Secondary message	RPM can be part of a healthy diet as it is naturally low in carbohydrates and the protein can help support appetite control. RPM is a source of valuable vitamins and minerals which can support health in people following weight loss or diabetic diets.

8.6. Sample media quote

It is recommended that you ask a local expert, such as a medic, academic, dietitian or nutritionist to be quoted in press releases or rebuttals.

Dr xxxx said: “There is no consensus on why red and processed meat would be expected to influence our risk of type 2 diabetes. There are only findings from observational studies which are inconclusive and not designed to link a single food group with diabetes. High quality clinical studies, on the other hand, show that red meat is equally effective to white meat or plant proteins in supporting normal control of blood glucose and insulin. That means that people with diabetes can continue to enjoy red and processed meats in a healthy balanced diet. The best way to tackle rising levels of type 2 diabetes is to combat obesity, encourage regular physical activity and reduce our intakes of processed carbohydrates which we know are absorbed too quickly and can lead to poor blood sugar control”.

APPENDIX 1: Evidence summaries

Table 1: Summary of randomised controlled trials comparing daily red meat (RM) versus other dietary options – *impact on CVD risk factors*

Ref.	*Intervention*	*RM intake g/day*	*What was measured?*	*Conclusion*
1	*Chicken vs. RM*	*85g*	*Lipids*	*No difference*
2	*Soya vs. RM*	*-*	*BP, lipids*	*No difference*
3	*White meat vs. RM*	*170g*	*Lipids*	*No difference*
4	*White meat vs. RM*	*170g*	*Lipids*	*No difference*
5	*RM vs. high carbohydrate diet*	*170g*	*Lipids*	*RM better*
6	*RM vs. high carbohydrate diet*	*-*	*BP*	*RM better*
7	*RM vs. high carbohydrate diet*	*85g*	*BP*	*RM better*
8	*High RM vs. low RM*	*150g*	*Lipids*	*No difference*
9	*Lamb vs. chicken*	*-*	*Lipids*	*No difference*
10	*Pork vs. white meat or beef*	*140g*	*Lipids*	*No difference*
11	*Horse meat vs. usual diet*	*50g*	*Lipids*	*RM better*
12	*RM vs. DASH diet (low salt, high fruit/veg diet)*	*150g*	*BP*	*No difference*
13	*Pork vs. chicken/fish*	*-*	*BP*	*No difference*

References: (1) Scott (1994) Arch Intern Med 154:1261-7; (2) Yamashita (1998) Metabolism 47:1308-14; (3) Davidson (1999) Arch Intern Med 159:1331-8; (4) Hunninghake (2000) J Am Coll Nutr 19:351-60; (5) Noakes (2005) Am J Clin Nutr 81:1298-306; (6) Hodgson (2006) Am J Clin Nutr 83:780-7; (7) Nowson (2009) Nutr Res 29:8-18; (8) Roussell (2012) Am J Clin Nutr 95:9-16; (9) Mateo-Gallego (2012) Br J Nutr 107: 1403-7; (10) Murphy (2012) Nutrients 4:711-23; (11) Del Bó (2013) Int J Food Sci Nutr 64:147-54; (12) Roussell (2014) J Hum Hypertens 28:600-5; (13) Sayer (2015) Am J Clin Nutr 102:302-8.

Abbreviations: RM, red meat; BP, blood pressure; lipids includes total cholesterol, LDL cholesterol, triglyerides.

Table 2: Summary of randomised controlled trials comparing daily red meat (RM) versus other dietary options – *impact on body weight and composition*

Ref.	*Intervention*	*Diets and RM content*	*What was measured?*	*Effect of RM*
1	*Lean beef vs. chicken*	*Calorie-reduced diets*	*Body weight loss (6kg), body fat loss*	*No difference*
2	*RM once/day vs. soya protein diet vs. soya nut diet*	*RM in healthy diet replaced with soya*	*Body weight*	*No difference*
3	*RM vs. mushrooms*	*All RM substituted for mushrooms*	*Body weight loss, body fat loss*	*Mushrooms better*
4	*Pork vs. chicken vs. beef*	*Up to 1 kg/week*	*Body weight, body fatness, calories*	*No difference*
5	*RM vs. legumes*	*Replaced 2 servings of RM with legumes on 3 days/week*	*Body mass index, waist circumference*	*No difference*
6	*Animal protein (veal, pork, eggs) vs. legumes*	*19% calories from protein in 4 test meals; matched for fibre*	*Subjective appetite, energy intake*	*No difference*
7	*Soya vs. RM*	*Calorie-reduced diets*	*Weight loss 9%*	*No difference*
8	*RM vs. high carbohydrate diet*	*170g*	*Weight loss 7kg*	*No difference*
9	*RM vs. high carbohydrate diet*	*-*	*Body weight*	*No difference*
10	*Pork vs. white meat or beef*	*140g*	*Weight loss, body fat*	*Pork better*
11	*RM vs. plant-based diet*	*113g*	*Weight loss 5%*	*No difference*
12	*High vs. zero RM*	*150g*	*Weight loss 5%*	*No difference*

References: (1) Melanson (2003) Nutrition 19:409-14; (2) Azadbakht (2007) Br J Nutr 98:807-13; (3) Poddar (2013) Appetite 71:379-87; (4) Murphy (2014) Nutrients 6:682-96; (5) Hosseinpour-Niazi (2015) Eur J Clin Nutr 69:592-7; (6) Nielsen (2018) Nutrients 10. pii: E96; (7) Yamashita (1998) Metabolism 47:1308-14; (8) Noakes (2005) Am J Clin Nutr 81:1298-306; (9) Hodgson (2006) Am J Clin Nutr 83:780-7; (10) Murphy (2012) Nutrients 4:711-23; (11) Hill (2015) Am J Clin Nutr 102: 757-770; (12) Nowotny (2015) Diabetologia 58:255-64.

Abbreviations: RM, red meat.

Table 3: Summary of randomised controlled trials comparing daily red meat (RM) versus other dietary options – *impact on type 2 diabetes risk factors*

Ref.	*Intervention*	*RM g/day*	*What was measured?*	*Effect of RM*
1	*Pork vs. white meat/beef*	*140g*	*Blood glucose*	*No difference*
2	*RM vs. plant-based*	*113g*	*Metabolic syndrome*	*No difference*
3	*RM vs. dairy*	*~170g*	*Insulin sensitivity*	*RM better*
4 *5*	*High vs. zero RM*	*150g*	*Insulin sensitivity, blood glucose & insulin*	*No difference*
6	*RM vs. dairy*	*Single meal*	*Insulin response*	*No difference*
7	*High RM + refined grains vs. high carbs + fibre*	*200–300g RM including ≥50 g processed meat*	*Insulin sensitivity*	*RM + refined grains worse*

References: (1) Murphy (2012) Nutrients 4:711-23; (2) Hill (2015) Am J Clin Nutr 102: 757-770; (3) Turner (2015) Am J Clin Nutr 101:1173-9; (4) Nowotny (2015) Diabetologia 58:255-64; (5) Karusheva (2018) Nutr Metab 15:90; (6) Turner (2016) Am J Clin Nutr 103:71-6; (7) Kim (2017) Metabolism 68:173-183.

Abbreviations: RM, red meat.

APPENDIX 2: Facts and figures

Table 4: Intakes of red meat processed meat by country (g/day)

	Red meat (g/d)	Processed meat (g/d)	Red meat (g/d)
BE	-	#32.0	-
DE	40.4	62.0 (#47.1)	102.4
DK	56.8	38.6	95.4
EL	35.4	7.9 (#20.0)	43.3
ES	55.9	41.2 (#31.8)	97.1
FR*	44.4	30.0 (#36.6)	74.4
GB	32.3	30.4 (#17.0)	62.6
IE	50.7	25.4 (#35.0)	76.1
IT	49.8	26.6	76.4
NL	52.4	55.2 (#23.0)	107.6
NO*	28.5	46.4	74.9
SE	46.0	54.6	100.6

References: Wyness L et al. (2011) Nutrition Bulletin 36: 34–77.
Note: data for Norway and France available for women only; # data supplied by industry.

Table 5: Which nutrition claims are authorised in the EU for red meat?

	Rich Source	Source	Protein	Sodium	Fat
Beef	Niacin, vitamin B6, vitamin B12, zinc	Riboflavin, iron, potassium, phosphorus	Naturally rich	Naturally low in sodium	No claims possible*
Lamb	Niacin, vitamin B12, zinc	Vitamin B6, potassium, phosphorus	Naturally rich	Naturally low in sodium	No claims possible*
Pork	Thiamin, niacin, vitamin B6, vitamin B12	Riboflavin, zinc, potassium, phosphorus, selenium, pantothenic acid	Naturally rich	Naturally low in sodium	Several cuts of pork are low in saturate fat

Reference: AHDB nutrition claims project, UK. Claims must be based by law on 100g as sold.
*Foods must contain no more than 3g of fat or 1.5g of saturated fat per 100g to make a claim.

Table 6: Which nutrition claims are authorised in the EU for processed meats?

	Vitamins 'source'	**Minerals 'source'**	**Protein/fat**
Gammon raw	Thiamin, niacin, vitamin B12	Phosphorus, selenium	Rich source
Salami	Thiamin, niacin, vitamin B6, vitamin B12	Phosphorus, zinc	Source
Back bacon lean raw	Thiamin, niacin, vitamin B6, vitamin B12	Phosphorus, selenium	Rich source
Frankfurter	Thiamin, niacin, vitamin B12	Phosphorus,	Source
Ham sliced	Thiamin, niacin, vitamin B6, vitamin B12	Potassium, phosphorus, selenium	Rich source/low saturated fat

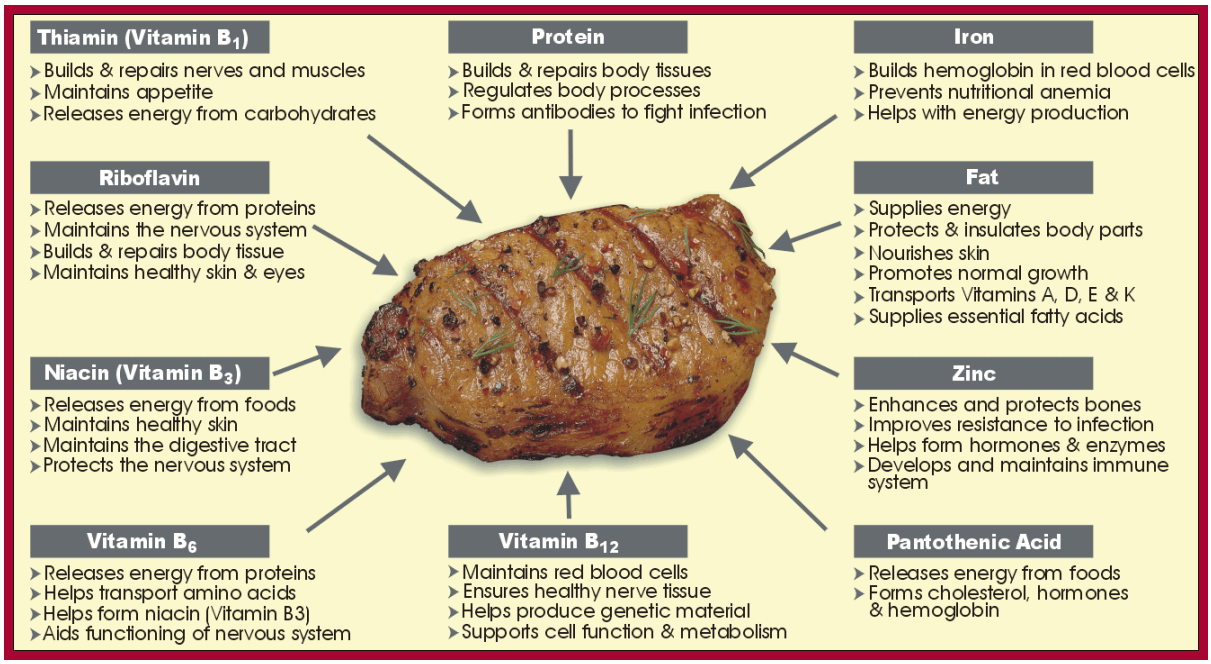
Reference: McCance & Widdowson's Composition of Foods integrated database (2015). Claims must be based by law on 100g as sold.

Table 7: Nutritional composition of processed meats

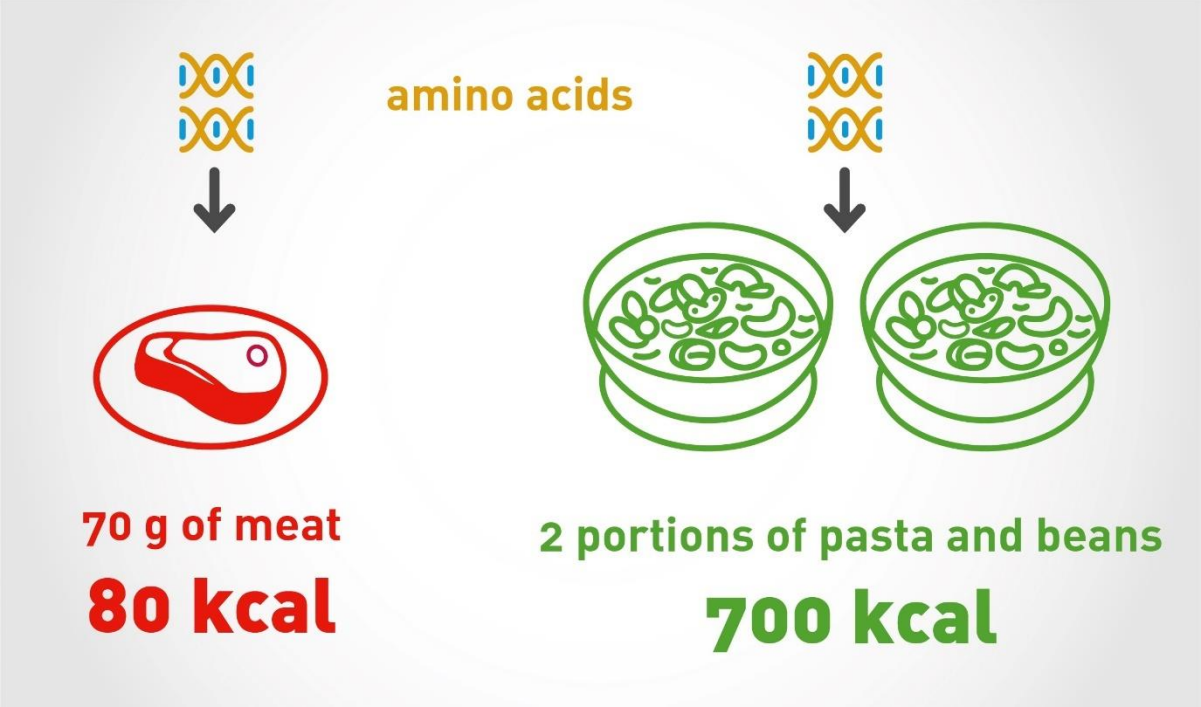
Per 100g	**Energy (kcal)**	**Protein (g)**	**Fat (g)**	**Saturated fat (g)**	**Sodium (mg)**
Gammon grilled	199	27.5	9.9	3.4	1430
Salami	438	20.9	39.2	14.6	1360
Back bacon lean grilled	214	25.7	12.3	4.6	1530
Frankfurter	287	13.6	25.4	9.2	730
Ham sliced	107	18.4	3.3	1.1	800

Reference: McCance & Widdowson's Composition of Foods integrated database (2015).

APPENDIX 3: Infographics



http://www.sunhavenfarms.com/pork-nutrition/



http://carnisostenibili.it/en/the-nutritional-value-of-meat-and-cured-meats/comparison-of-amino-acids-contained-in-a-slice-of-meat-and-a-portion-of-pasta-and-beans-in-kcal/

APPENDIX 4: National guidelines on meat

Country	Recommendation
Austria	The Austrian Nutrition Society (ANS, ÖGE) recommended no more than 3 portions (100-150 g) a week of meat and meat products.
Finland	In 2014 the State Advisory Board for Nutrition in Finland recommended that processed meat products and red meat should not be consumed more than 500 g /week. It is explained that 500 g is the same as 700-750 g of meat in raw weight. Poultry meat is recommended in general, because it is lean and the quality of fat better than fat in e.g. beef and lamb meat. Red meat should be as lean as possible and the salt content as low as possible. There are recommendations for other products as well, e.g. eggs 2-3 per week. The recommendations in Finland mention environmental aspects of food as well. This was made according to the Nordic nutritional recommendations: http://norden.diva-portal.org/smash/get/diva2:704251/FULLTEXT01.pdf
France	The French High Council of Public Health published an amendment in February 2017 to recommend limiting consumption of processed meats and not to exceed 150g per week.
Germany	The German Nutrition Society (DGE) recommended that, as part of a wholesome diet, consumers should not eat more than 300-600 grams of meat and sausages per week. Meat contains minerals and vitamins B1, B6 and B12. The recommendation underlines that, from the health point of view, white meat (poultry) is more favourable than red meat (beef, pork). The DGE advices to rather choose low-fat products, especially with meat and dairy products.
The Netherlands	The Health Council of the Netherlands has recommended that people limit the consumption of red meat, particularly processed meat.
UK	In 2011 the Scientific Advisory Committee on Nutrition (SACN) advised that adults with relatively high intakes of RPM meat (90 g/day or more) should consider reducing their intakes to 70g/day (cooked weight), which was the national average. SACN concluded that a reduction to this level would have little impact on the proportion of adults with low iron and zinc intakes.
UK	The Eatwell Guide is a policy tool used to define government recommendations on eating healthily and achieving a balanced diet. The UK Government in 2016 recommended to 'eat less RPM meat'.

IT	Linee guida per una sana alimentazione – 2003: Among meats, prefer the lean ones and eliminate visible fat. The meat, fish and eggs group has the main function of providing high quality proteins and oligoelements (in particular zinc, copper and highly bioavailable iron, that is easily absorbable and usable) and also B complex vitamins (in particular vitamin B12). Within the group it is preferable lean meats (whether they are bovine, poultry, pigs, etc.) and fish. On the other hand, the quantity of products with higher fat content, such as certain types of meat and sausages, should be moderated. Portion: 100 g meat 50 g processed meat